Purpose of the Course:
Topics covered include a critical of current forecasting models and issues in forecast evaluation. The emphasis is on the practical skills, both applied and theoretical, which the economist requires in the industrial, financial, and/or governmental environment. While most examples will be drawn from macroeconomics, some individual or firm-level examples will be discussed, including methods used in the forecasting of the demand for new products or financial instruments.

Required Textbooks:


Grading Scheme:
The final grade in the course will be assigned on the basis of:

1) terms tests held on Oct. 17 and November 26 40%
2) short practical assignments 20%
3) a "major" project or term paper due on December 21 40%

There will be no formal final examination.

Course Outline:

I Introduction
II Classical Time-Series Methods
III Box-Jenkins Methods
IV Econometric Forecasting
V Comparing the Forecasting Methods
VI Subjective Information and Judgmental Adjustments
VII Indicators of Economic Activity
VIII Special Topics and Applications

Additional Readings may be assigned on the assignment sheets

Office Hours: 10:30-1:30 Monday, Tuesday and Wednesday
(tentative)
I. Introduction

Required Readings:
Makridakis, Wheelwright and Hyndman, *Forecasting: Methods and Applications*, chapters 1-2.

1. Purpose and Objectives of Economic Forecasts
   
a) What is Forecasting?

b) Why Forecast?

c) Types of Forecasts

d) Macroeconomic Forecasts

e) Choosing a Forecast Method

f) Managing the Forecast Process

- g) Review of Basic Statistical Concepts
   
i Descriptive statistics

ii Probability distributions

iii Sampling distributions

iv Statistical estimation

v Hypothesis testing

vi Basic correlation and regression analysis

h) Data Sources

i) Data Patterns

2. Overview of Forecasting Methods
   
a) Subjective

b) Statistical

   
c) Behavioral

   
d) Summary of methods to consider

3. Methods of Forecast Evaluation

Key then is a cost-benefit analysis of the forecast method.
Areas of cost:

1. developmental    2. maintenance    3. operational
4. Measuring Forecast Benefits (Accuracy)

a) Mean Error

b) Mean Absolute Error (Deviation)

c) Root Mean Square Error

d) Absolute Mean Percentage Error or Root Mean Square Percentage Error

e) Theil's U Inequality

f) Turning Point Tests

5. How do we construct these measures?

a) In sample performance evaluation

b) ex post forecast evaluation

c) backcasting

d) ex ante forecast evaluate

5. Graphic Analysis of Errors
II Classical Time Series Methods

Required Readings:
Makridakis et al., chapters, 3-4.

1. Classical Time Series Models
   a) multiplicative models
   b) additive models

2. Simple Averaging
   a) naive models
   b) means
   c) moving averages
   d) exponential smoothing
      i) simple and double smoothing
      ii) Holt's method
      iii) Winter's method

3. Trend Extrapolation
   a) regression against time
      i) white noise
      ii) a random walk
      iii) an autoregressive trend
      iv) a linear trend
      v) a quadratic trend
   b) simple curve fitting
   vi) an nth order polynomial
   vii) semi-logarithmic
   viii) modified exponential
   ix) Gompertz
   x) logistic

4. Seasonal Adjustment
   a) dummies in regression
   b) moving average methods
III Box-Jenkins Methods

Required Readings:
Makrikadis et al., chapters 7 and 8.


1. Pros and Cons of ARIMA Forecasting

2. Types of Time Series Processes
   a) random walk
   b) white noise
   c) stationary
   d) moving average
   e) autoregressive
   f) mixed ARIMA

3. Autocorrelation and Partial Autocorrelation Functions

4. Four Key Steps in Forecasting Using the B-J Method
   a) identification
   b) estimation
   c) diagnostic checking
   d) forecasting

5. Examples of the Full Process

6. Advanced Topics in Time Series Analysis
   a) Seasonal ARIMA Models
   b) Invertibility and Stationarity
   c) ARIMA Process for Sum of Series
   d) Transfer Functions
   e) Vector Autocorrelations (VAR) and Vector ARIMA Models
IV Econometric Methods and Models

Required Readings:
Makridakis et al., chapters 5, 6, 8.


1. Introduction
   a) hypothesis testing
   b) policy analysis
   c) forecasting
   d) sources of forecast error

2. Unconditional Forecasting
   a) point forecasting
   b) interval forecasting

3. Conditional Forecasting (single equation)
   a) point forecasts
   b) interval forecasts
   c) sensitivity analysis

4. Validation, Evaluation and Common Problems in Econometric Forecasting Models
   a) a) evaluation statistics
   b) theoretical validation
   c) statistical validation
   d) Multicollinearity
   e) Heteroscedasticity
   f) Autocorrelation
   g) co-integration and stationarity

5. Introduction to Simulation Models
   a) evaluating simulation models
   b) model estimation
   c) model behaviour
   d) tuning and adjusting simulation models
   e) stochastic simulation
V Comparing the Forecasting Methods

Required Readings:
Makrikadis et al., chapter 11.

1. Introduction
2. Uses of Different Methods
3. Costs of Different Methods
4. Combined Forecasts
5. Evaluation by Other Methods

VI Subjective Information and Subjective Adjustments & VII Indicators of Economic Activity

Required Readings:
Makridakis et al, chapters 9 and 10

1. Multiple Scenarios
2. Use of Survey Data and Methods in Forecasting
3. Judgmental Forecast Methods
4. Use of Judgmental Adjustment with Other Methods
5. Indicators of Economic Activity
   a) Indicators and Diffusion Indices
   b) Filtering the Series
   c) Timing and Stability Issues
   d) Sectoral Analysis
VIII Special Topics and Applications

1. Consumer and Producer Cost Systems
2. Financial Applications
3. Technological Forecasting
4. Forecasting New Product Demand

Suggestions for the Final Project

The suggestions contained in this outline are meant to be a rough guide and in no way should be interpreted as the only possible approach to the only available topics. I strongly urge all students to discuss their own project with me as soon as a preliminary outline has been developed.

The purpose of this exercise is to allow you to illustrate your ability to apply some of the techniques covered in the course to a specific problem. Thus, you must outline the question that you will attempt to answer, the techniques that you are using, the problems that you have encountered, and how you have attempted to solve them. The required length of the paper is an issue that I always try to avoid specifying, as it will depend upon the nature of your topic and how you approach it. The key is that your topic must be worth doing and you must have done it. However, as a rough guide, papers generally wind up in the eight to ten typed page range.

Appropriate topics include:

1. An in-depth application of one of the techniques (simple time series, econometric, ARIMA) to produce a forecast of an economic time series.
2. A comparison of two or more forecasting methods applied to a specific economic time series.
3. The construction of a small econometric model for the purpose of forecasting some aspect of economic activity.
4. A review of the assignments prepared for the course, with the purpose of improving the individual efforts and illustrating the comparative advantages of each method applied to your sector of the economy.

Again let me stress that this list is not meant to be comprehensive, but merely a guide for you to use to set up your own topic. Further guidance may be obtained by review some of the readings indicated on the topic outlines. Also, unlike the term assignments, the final project must be an individual effort. Feel free to seek advice at any time.

Recent Forecasting Project Titles
“A Forecast of Merchandise Imports from Mexico using ARIMA Models”
“The Crime Rate in Ontario”
“Forecasting the Demand for Money in Canada: Econometric and ARIMA Methodologies”
“Money Demand in Germany: 1984 Q1 - 1993 Q4”
“An Econometric Model of Investment in Germany”
“Forecasting Teledensity”
“Box-Jenkins ARIMA Modelling of SIMWARE Stock Price”
“Forecasting the Dow Jones Industrial Average Using a Random Walk Model”
“A Study on Interprovincial Migration: An Analysis of the Migration from Prince Edward Island to Ontario”
“Forecasting the Canadian Inflation Rate Using an Expected Inflation Series Constructed by a Simple Time-Series”
“Forecasting the Bank Rate: A Comparison of Methodologies”
“Forecasting Canadian Export Growth Using Rybczynski’s Theorem”
“Forecasting the Expected Rate of Return of IBM’s Shares”
“A Comparative Study of the Forecasting Ability of Company Management and Security Analysts”
“Gasoline Prices: A Forecast for the Summer”
“The Danger of Using Subjective Forecasts at the Government Level”
Box-Jenkins ARIMA Methodology and the Canadian/US Currency Exchange Rate”
“ARIMA Model for an Internet Index”
“Forecasting Canadian Exports with Simple Combining Techniques”
“A Forecast of Lobster Landings”
“Comparing Box-Jenkins with Exponential Smoothing in the Prediction of the Canadian Quarterly Unemployment Rate”
“The Box-Jenkins (ARIMA) Methodology and the Biotechnology Sector”
“Forecasting Income as a Function of Physical Attractiveness”
“Using Simple Time Series Models to Predict a Stanley Cup Winner”
“Forecasting Ontario University Tuition Fees”
“Predicting Average Gasoline Prices for the Summer of 2002”
“An Evaluation of the Performance on Time-Series Forecast of Quarterly Earning per Share: Evidences From Air Transportation Industry”
“Short-term Forecast of the Number of International Tourists Entering or Returning to Canada”
“Forecasting Interest Rates in Egypt: Comparison of an Econometric Model and Box-Jenkins Technique”
“Average Weekly Earning of Child Daycare Hourly Employees in Ontario”
“Forecasting the GDP Growth Rate in Pakistan Using an Econometric Model”
“Comparing the Box-Jenkins Approach with the Exponentially Smoothed Forecasting Model: Application to the Dow-Jones Industrial Average”

Project Suggestions Reading List

Anderson, Robert J., Jr. "A Note On Economic Base Studies And Regional Econometric Forecasting
Andrikopoulos, A. A., J. A. Brox and T. Gamaletsos. "Forecasting Canadian Consumption Using The
Dynamic Generalized Linear Expenditure System (DGLES)," Applied Economics, 1984,
v16(6), 839-854.
Andrikopoulos, A., J. Brox and E. Carvalho. "Shift-Share Analysis And The Potential For Predicting
Regional Growth Patterns: Some Evidence For The Region Of Quebec, Canada," Growth and
Change, 1990, v21(1), 1-10.
Andrikopoulos, Andreas A. and James A. Brox. "Demand Systems For Energy Consumption By The
Andrikopoulos, Andreas A. and James A. Brox. "The Urban Housing Market: A New Approach For
Estimating Demand For Housing By Dwelling Type," Journal of Urban Economics, 1984,
Andrikopoulos, Andreas A., James A. Brox and David E. Matthews. "Interest Rate Elasticities And
Canadian Household Portfolio Allocation," Quarterly Review of Economics and Finance,
Andrikopoulos, Andreas A., James A. Brox and Theodore A. Georgakopoulos. "A Short-Run
Assessment Of The Effects Of VAT On Consumption Patterns: The Greek Experience,"
Andrikopoulos, Andreas A. and James A. Brox, "Cost Structure, Inter-factor Substitution and
Complementarity, and Efficiency in the Canadian Agricultural Sector", Canadian Journal of
Andrikopoulos, Andreas A. and James A. Brox, "Measuring the Impact of Research and Develop-
ment on Technological Change: An Application of Basmann-Hayes-Slottje's Approach",
Andrikopoulos, Andreas A. and James A. Brox, "Portfolio Allocation by Greek Banks", Spoudai,
Andrikopoulos, Andreas A. and James A. Brox, "Canadian Inter-City Passenger Transportation: A
Simultaneous Equation Approach", International Journal of Transportation Economics,
October 1990.
Andrikopoulos, Andreas A., James A. Brox and Emanuel Carvalho, "A Further Test of the
3, summer 1987.
Andrikopoulos, Andreas A., James A. Brox and Emanuel Carvalho, "Substitution in the Demand for
Protein Commodities", Canadian Journal of Agricultural Economics, Vol. 32, No. 1, March
1984, 141-150.
Andrikopoulos, Andreas A. and James A. Brox, "The Demand for Deposits and Risk Sensitivity:
Andrikopoulos, Andreas A. and James A. Brox, "Short-Run Forecasts of Consumer Expenditures
Based on the Linear Expenditure Systems", Atlantic Economic Journal, Vol. XI, No. 4,
Andrikopoulos, Andreas A. and James A. Brox, "A Further Investigation of Linear Expenditure
Systems with Zero, First and Second Degree Autocorrelation Structures", The Greek


Chambers, Marcus J. "Forecasting With Demand Systems: A Comparative Study," *Journal of


Geary, R. C. "Comparative Efficiency Of Maximum Likelihood And Ex Ante Reduced Form For


Hogan, Lindsay I. "A Comparison Of Alternative Exchange Rate Forecasting Models," The


Koehler, Anne B. and Emily S. Murphree. "A Comparison Of Results From State Space Forecasting


Zellner, Arnold. "Folklore Versus Fact In Forecasting With Econometric Methods," Journal of